

Remarks/Arguments

Claim Summary

Claims 1, 10, 13, 25, 30, 38 and 50 are amended. Claims 22, 35, and 47 are canceled. New claim 51 is added.

Claims 1-21, 23-34, 36-46, and 49-51 are pending in the application.

Claim Rejections - 35 USC § 102

Claims 1-3, 9, 11-12, 13-15, 21, 23-28, 34, 36-40, 46, 48-50 were rejected under §102(e) as being anticipated by Chen et al. (US 6,551,927).

Independent claim 1 is amended to recite that a cobalt-containing film is formed at a temperature at which cobalt of the cobalt-containing film and silicon of a silicon-containing conductive region react with each other to form a diffusion restraint interface film. Independent claims 13, 25, 38, 50 are amended to recite that a cobalt-containing film are formed at a temperature between 300 and 500°C. The addition of these limitations in the independent claims now moots the Examiner's §102(e) rejection.

Claim Rejections - 35 USC § 103(a)

Claims 4-8, 10, 16-20, 22, 29-33, 35, 41-45, and 47 were rejected under §103(a) as being unpatentable over Chen et al. in view of Ku et al. (US 6,329,276).

As discussed above, the Applicants have amended the independent claims to recite that a diffusion restraint interface film (claim 1), and a cobalt-

containing film and the diffusion restraint interface film are formed at a temperature between 300 and 500° (Claims 13, 25, 38, 50).

Claim 1 has been amended to recite that the diffusion restraint interface film is formed between the cobalt-containing film and the silicon-containing conductive region. Neither Chen et al. nor Ku et al. teaches or suggests the formation of the diffusion restraint interface film. The diffusion restraint interface film decreases cobalt diffusion in a subsequent annealing step. The lowering of cobalt diffusion decreases sheet resistance loading and leakage current. Paragraph [0045] and Fig. 7.

Original claims 22, 35, and 47 recite that the cobalt-containing film is formed at a temperature between 300 and 500°C. The Examiner rejected these claims and stated:

“Regarding claims 10, 22, 35, [and] 47, both Chen and Ku fail to disclose wherein the cobalt-containing film is formed at a temperature of 300 and 500°C. However, the selection of such parameters such as **energy, concentration, temperature, time, molar fraction, depth, thickness, etc.**, used to form cobalt film in the process of forming cobalt-silicide would have been held to be within the level of ordinary skill in the art. ‘Normally, it is to be expected that a change in **energy, concentration, temperature, time, molar fraction, depth, thickness, etc., or in combination [sic] of the parameters** would be unpatentable modification. Under some circumstances, however, changes such

as these may impart patentability to a process if the particular ranges claimed produce new and unexpected result which is different in kind and not merely degree from the results of the prior art...such range are termed 'critical ranges and the applicant has the burden of proving such criticality."

As disclosed in the specification at paragraphs [0045] and [0055] the cobalt containing film is formed at a temperature of 300-500°C. At these temperatures the diffusion restraint interface film is formed between the substrate and the cobalt containing film. The diffusion restraint interface film slows the formation of cobalt silicide film in a subsequent annealing step. Specifically, cobalt from the cobalt containing film can only diffuse toward a substrate through a diffusion path of the interface film. Fig. 7. The lowering in cobalt diffusion helps in the decrease in sheet resistance loading and leakage current. The temperature range produces the diffusion restraint interface film; the diffusion restraint interface film prevents undesired effects; therefore, the temperature range and the diffusion restraint interface film "produce new and unexpected result which is different in kind and not merely degree from the results of the prior art."

The Applicants respectfully submit that the temperature range of 300-500°C to form the diffusion restraint interface film is more than suggest routine optimization, but a critical condition in forming the diffusion restraint interface film, which is a critical element in decreasing sheet resistance loading and leakage current.

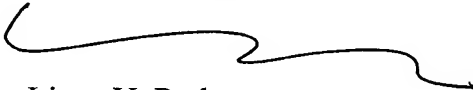
For at least the reasons stated above, the Applicants believe that the present claims are patentable over Chen et al. and Ku et al. individually or in combination.

Conclusion

No other issues remain, reconsideration and favorable action upon claims 1-21, 23-34, 36-46, and 49-51 present in the application are requested.

Respectfully submitted,

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